RECLAMATION

*Managing Water in the West*

Final Environmental Assessment and Finding of No Significant Impact

# Glenn-Colusa Irrigation District
# Stony Creek Fan Aquifer Performance Testing Plan

U.S. Department of the Interior
Bureau of Reclamation
Mid-Pacific Region

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**United States Department of Interior**
**Bureau of Reclamation**
**Mid-Pacific Region**
**Sacramento, CA**

**FINDING OF NO SIGNIFICANT IMPACT**

**GLENN COLUSA IRRIGATION DISTRICT STONY CREEK FAN AQUIFER PERFORMANCE TESTING PLAN**

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FONSI No.: 09-01-MP

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**GLENN-COLUSA IRRIGATION DISTRICT STONY CREEK FAN AQUIFER PERFORMANCE TESTING PLAN**

In accordance with section 102(2)(c) of the National Environmental Policy Act of 1969, as amended, Reclamation has determined that funding the implementation of the Stony Creek Fan (SCF) Aquifer Performance Test (APT) is not a major Federal action significantly affecting the quality of the human environment; therefore, an Environmental Impact Statement is not required. This Finding of No Significant Impact (FONSI ) is supported by Reclamation's Environmental Assessment (EA), *Glenn-Colusa Irrigation District, Stony Creek Fan Aquifer Performance Testing Plan* and is hereby incorporated by reference.

**Background**

Glenn Colusa Irrigation District (GCID) has been cooperating with neighboring water purveyors, the Bureau of Reclamation (Reclamation), the California Department of Water Resources (DWR), and other parties for several years on regional water management planning in the Sacramento Valley. One of GCID's planning activities is the Stony Creek Fan Conjunctive Water Management Program (SCF Program), a collaborative effort among GCID, the Orland Unit Water Users Association (OUWUA), and Orland-Artois Water District (OAWD), collectively referred to as the SCF Partners. The SCF Partners are seeking solutions to local water management problems in a regional, cooperative context.

The current emphasis of the SCF Program is the exploration of regional aquifer systems to better define the physical and operational characteristics of those systems, and to better understand the potential effects of ongoing and potential future groundwater development. This involves physical testing of the aquifer systems according to a proposed Aquifer Performance Testing Plan (APTP) developed by the SCF Partners. The proposed action involves funding from Reclamation in support of the SCF Partners APT.

**Findings**

1. Surface water resources: The proposed action would not result in a change or impact to GCID, OUWUA or OAWD surface water operations. Surface water deliveries would continue to be delivered within the SCF Partners service areas using existing conveyance facilities. Surface water deliveries would be augmented with groundwater. The conveyance of surface water or groundwater would not adversely impact existing water supplies. Depletions from the Sacramento River or Stony Creek are not expected to occur as a result of this project. Depletions in streams to the east of the Sacramento River would not occur.

2. Groundwater Resources: The quantity of groundwater to be pumped (up to 26,530 af/season), when compared to the regional average annual groundwater production results in a 2% increase. The duration of the test (two irrigation seasons) is temporary and would not result in significant adverse impacts to the resource. In

addition, GCID has included monitoring and mitigation in the proposed action which would ensure significant adverse impacts to existing groundwater resources would not occur. The monitoring and mitigation plan would be used in conjunction with the Glenn County Groundwater Management Plan and other applicable local groundwater plans.

**3.** Land Use: The proposed action would not adversely impact land management or agricultural practices within GCID, OUWUA or OAWD. Construction activities would be limited to the small areas as defined in the EA. Construction equipment would be brought on site using existing surface and gravel roads.

**4.** Air Quality: There would be temporary impacts to air quality due to emission of air pollutants during the period of construction. Permits would be acquired for the emission of air pollutants if required. It is estimated that each well would require approximately 112 hours (about 5 days) of equipment operation to construct. Due to the short duration of construction, there would not be significant adverse impacts to air quality. Additionally, the production wells are electric and would be powered by Pacific Gas and Electric which is a regulated generation facility. The use of electricity to power the test production wells would not result in significant impacts to air quality.

**5.** Biological Resources: The proposed action would not result in any physical changes to the environment resulting in significant adverse impacts to biological resources. In accordance with Section 7 of the Endangered Species Act (ESA), Reclamation consulted with the United States Fish and Wildlife Service and received a letter concurring that the proposed action is not likely to adversely affect giant garter snakes.

**6.** Indian Trust Assets: The absence of Indian Trust Assets (ITA) in areas affected by the proposed action precludes any impact. The nearest ITA is the Paskenta Rancheria which is approximately 13 miles NW of the project location.

**7.** Environmental Justice: Minority or disadvantaged populations or communities would not be adversely impacted by the proposed action. The proposed action would not cause dislocation or changes in employment to minority or disadvantaged populations or communities within Glenn County. Flooding, drought and disease are not impacts that would occur as a result of the proposed action. No human health impacts would occur as a result of the proposed action. The temporary impacts of construction would not disproportionately affect any minority or disadvantaged population in the project area, therefore the effects are not considered significant.

**8.** Cultural Resources: Based on the analysis in the EA, cultural resources would not be adversely impacted as a result of the proposed action. There is no potential to affect historic properties as a result of the proposed action. In accordance with the National Historic Preservation Act, Reclamation consulted with the California State

Historic Preservation Officer (SHPO) and received concurrence from SHPO that the proposed action would have no adverse effect to historic properties.

**9.** Cumulative Impacts: The three resources identified as having potential impacts resulting from the proposed action are groundwater, biological resources (giant garter snake), and air quality. Although each of these resources would have temporary impacts as a result of the proposed action, the impacts would not cause significant adverse cumulative impacts. Groundwater would be impacted at a minimal level. When compared to the regional average annual groundwater pumping the proposed action would result in a temporary 2% increase. Although there is an additive cumulative impact annually of pumping 26,530 acre-feet of groundwater for two irrigation seasons when compared to all other past, present and future actions, the monitoring and mitigation included in the proposed action would ensure significant impacts do not occur during the APT. Therefore, significant cumulative impacts to groundwater would not occur. Temporary impacts to the giant garter snake habitat may occur, however, those impacts would not result in take and therefore, the proposed action would not result in cumulative impacts to the giant garter snake. A cumulative additive impact to air quality would result during APT construction, however, the impact would be temporary and minimal (5 days for each well) and would not result in a significant cumulative impacts to air quality.

# Table of Contents

# Appendices



# Figures



# Tables

# Section 1 Purpose and Need for Action

## 1.1 *Introduction*

Glenn-Colusa Irrigation District (GCID) has been cooperating with neighboring water purveyors, the Bureau of Reclamation (Reclamation), the California Department of Water Resources (DWR), and other parties for several years on regional water management planning in the Sacramento Valley. One of GCID's planning activities is the Stony Creek Fan Conjunctive Water Management Program (SCF Program), a collaborative effort among GCID, the Orland Unit Water Users Association (OUWUA), and Orland-Artois Water District (OAWD), collectively referred to as the SCF Partners. The SCF Partners are seeking information, data, and solutions to local water management problems in a regional, cooperative context.

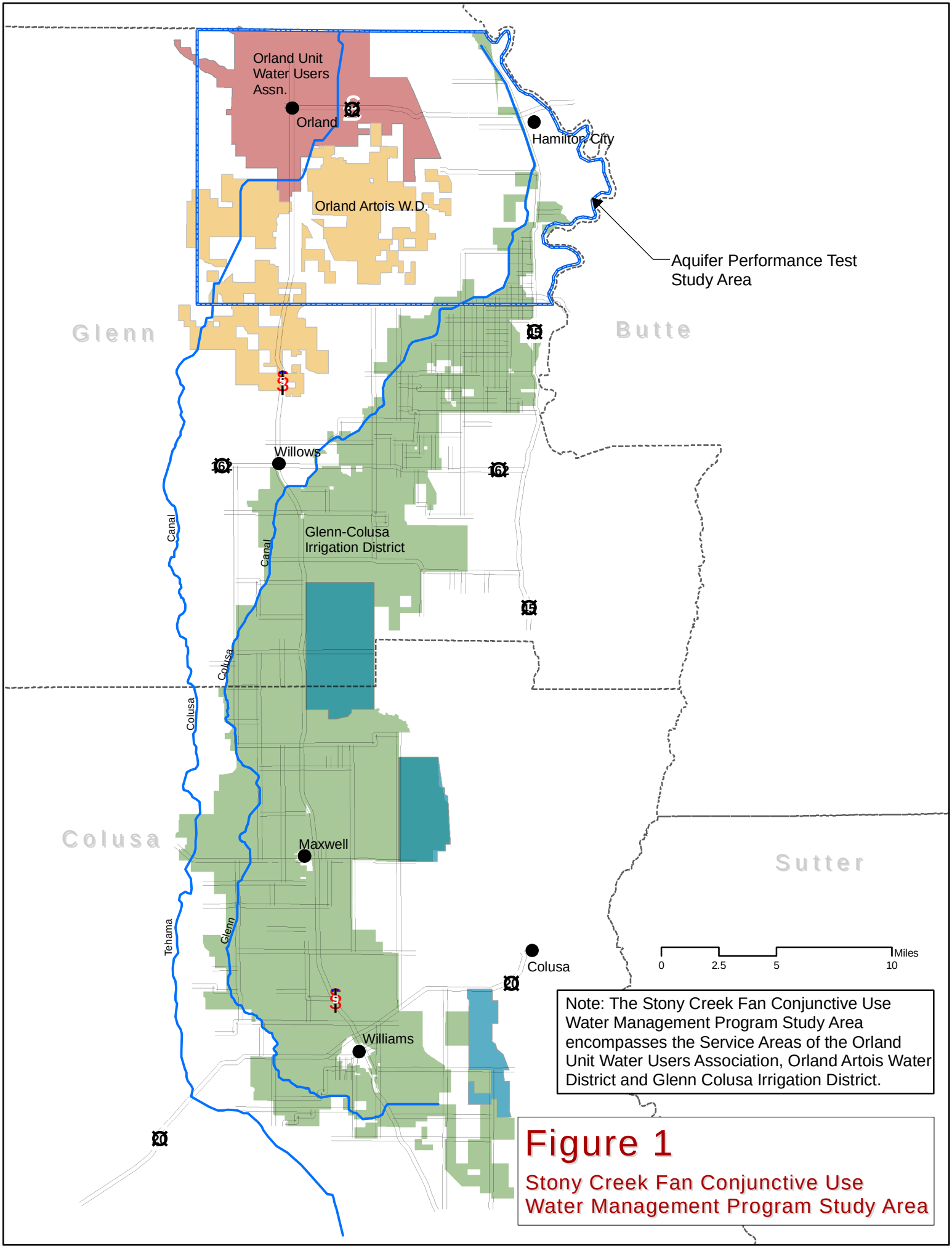
The current emphasis of the SCF Program is the investigation, study, and understanding of regional aquifer systems to better define the physical and operational characteristics of those systems. The proposed project, known as the Stony Creek Fan Partners Aquifer Performance Test (APT), involves physical testing of the aquifer systems according to a proposed Aquifer Performance Testing Plan (APTP) developed by the SCF Partners. Reclamation proposes to partially fund the APT.

GCID, on behalf of the SCF Partners, has completed a California Environmental Quality Act (CEQA) compliance document for its proposed action to implement the APT. That document is appended to this Environmental Assessment (EA) as Appendix A.

## 1.2 *Background*

The SCF Partners formalized their cooperative relationship in 2001 through a memorandum of understanding (MOU) that was subsequently renewed and updated in 2006. Pursuant to the MOU, the SCF Partners have conducted an initial feasibility investigation of conjunctive water management within their service areas, tested groundwater recharge by surface spreading, participated in development of the Stony Creek Fan Integrated Groundwater and Surface Water Model [1](SCFIGSM), conducted outreach to inform neighboring counties, districts and others of their activities and findings, and undertaken various other related activities. Figure 1 shows the locations of SCF Partner's respective service areas, which collectively comprise the SCF Program study area.

[1] The Stony Creek Fan Integrated Groundwater and Surface Water Model was developed through the collaborative efforts of interested parties in Glenn County, including the SCF Partners and the County of Glenn. The model enables simulation of alternative groundwater and surface water management strategies and potential projects in the Eastern Glenn County region. The model was completed in 2004. Funding for model development was provided by the California Department of Water Resources.




# Figure 1

## Stony Creek Fan Conjunctive Use Water Management Program Study Area

Collectively, the SCF Partners provide surface water supplies to more than 210,000 acres of irrigated lands and wildlife refuges, including nearly 130,000 acres in Glenn County. Additionally, there are about 75,000 acres of irrigated lands in Glenn County that currently rely exclusively on groundwater pumping each year. Surface water supplies provided by the SCF Partners and other surface water purveyors[2] are critically important for sustaining Glenn County's water supply and economic vitality. Surface water supplies provided by the SCF Partners meet a large portion of the irrigation water demand in Glenn County.[3] Based on water balance analyses developed for this area, deep percolation of applied surface water within the SCF Partners' service areas[4] contributes about 180,000 acre-feet annually of groundwater recharge[5]. Groundwater monitoring and mapping reveals that recharged groundwater migrates outside of the SCF Partners' service area and benefits surrounding lands that rely exclusively on groundwater for irrigation and other purposes. Thus, the Glenn County area has and continues to rely on conjunctive use of surface water and groundwater supplies to satisfy its water needs. The APT would complement this ongoing conjunctive use by characterizing the extent and distribution of the multiple aquifer systems in the SCF Partners' service areas.

## 1.3 *Purpose and Need*

Water demands in the Sacramento Valley continue to grow while developed supplies have not increased appreciably over the past several decades. Population growth and economic development in Glenn County, the region, and Sacramento Valley are resulting in both larger and firmer water demands. Changes in irrigated agricultural practices are increasing the demand for water. Additionally, there are important environmental water uses that need to be protected or expanded to sustain the Valley's rich and diverse natural habitats.

Because essentially no new surface water supplies have been developed in the Sacramento Valley for several decades, and because groundwater can be readily developed at most locations within the Valley, new water demands are being met primarily through development and use of groundwater by private landowners, irrigation and water districts, towns and cities, industries, and others. Yet, despite this ongoing trend of increasing groundwater development and use, there is a lack of information regarding the characteristics of the Valley's groundwater systems and how they behave. Due to these information gaps, the capability of the aquifers to sustain current and future regional water demands, and possibly to meet water needs outside the region, is unknown.

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[2] Other surface water purveyors serving Glenn County lands are Glide WD, Kanawha WD, Princeton-Codora-Glenn ID, Provident ID, Willow Creek MWC, RD 2106, and Western Canal WD.

[3] Under current conditions, water use in the SCF Partners' service areas is predominately for agricultural irrigation, and the primary sources of supply are surface water. Groundwater serves as a supplemental supply source, with the amount of groundwater pumped being dependent on the availability of surface water supplies, which varies from year to year. The proportions of surface water and groundwater use also vary among the SCF Partners, with OAWD having the least reliable surface water supply and, consequently, the largest amount of groundwater pumping on a per acre basis. To avoid potential local water user impacts in the Tehama Formation, the Lower Tuscan Formation could provide an alternative supply to relieve some of the demand in the upper aquifers underlying OAWD. Per acre pumping amounts are lower in GCID and the OUWUA due to the relatively high reliability of their surface supplies. However, surface water shortages also occur occasionally in both GCID and the OUWUA.

[4] Includes only the Glenn County portion of GCID.

[5] Based on water balance analyses conducted in relation to the SCF Feasibility Investigation for the 1970 through 2000 period (Technical Memorandum No. 3, Davids Engineering, 2006).

The purpose of the proposed SCF APT is to develop important information that is currently lacking and is needed to responsibly plan groundwater development and management within the SCF Program study area and adjoining areas that share the underlying aquifer systems. Through a program of planned testing, the SCF APT would yield scientific information about aquifer characteristics such as detailed hydrostratigraphy, aquifer transmissivity, storage, hydraulic conductivity between layers, and sources of recharge. Among other uses, this information would assist in formulating sustainable conjunctive management strategies, be incorporated into existing and new analytical tools and numeric models of groundwater systems, including the SCFIGSM; provide a basis for evaluating possible impacts to existing groundwater users; and, assist in understanding aquifer recharge mechanisms and how recharge areas and mechanisms could be protected.

# Section 2 Alternatives Including the Proposed Action

## 2.1 *No Action*

Under the No Action alternative, the SCF APT would not be implemented in the manner that is proposed with federal funding, which involves coordinated actions among neighboring water purveyors, high levels of scientific rigor and quality control; and wide dissemination of information. However, efforts by individual entities to understand groundwater conditions would likely continue in piecemeal fashion, subject to the constraints of available local resources. Opportunities to increase reliable water supplies through conjunctive management of groundwater and surface water would be explored at a much slower pace and with less scientific rigor. Findings would not be as widely shared. Ongoing groundwater development would continue, limited by the existing level of data to scientifically assess the implications or sustainability of implementing such actions.

## 2.2 *Proposed Action*

### *2.2.1 SCF Aquifer Performance Testing Plan*

#### 2.2.1.1 Overview of Testing Plan Elements, Phasing and Institutional Framework

The SCF APT defines a research program in Glenn County that includes drilling up to five test holes, installing up to seven test-production wells, and conducting well efficiency and aquifer performance testing. Well drilling would help characterize the extent and distribution of the multiple aquifer systems within the SCF APT study area. The test-production wells would be constructed to focus production on the deeper aquifer systems. The aquifer performance testing and monitoring would be conducted to help identify the aquifer properties surrounding the individual test-production wells, and the regional interaction between the shallower and deeper aquifer systems. In order to accomplish this goal, aquifer performance testing would be conducted using single and multiple test-production wells during irrigation and non-irrigation periods.

The SCF APT would be implemented in three phases. During Phase 1, the test holes and wells would be sited, drilled and tested for capacity and hydraulic parameters. During Phase 2, multi-day pumping tests would be conducted at each test-production well individually to refine estimated hydraulic parameters and assess any resulting changes in local groundwater levels. Finally, Phase 3 would assess regional changes to groundwater levels through aquifer performance testing for two irrigation seasons (typically April through October) following the Phase 1 testing. Each phase of the aquifer testing plan would be implemented within the institutional and management framework of the Glenn County Groundwater Management Plan (GMP), with input from the Glenn County Water Advisory Committee (WAC) and Technical Advisory Committee (TAC). Additional information on the Glenn County GMP and WAC is included in Appendix B.

All groundwater pumped under the SCF APT would be used for irrigation or habitat maintenance in the SCF Partners' service areas. None of this groundwater would be used outside of these service areas, either directly or indirectly through a groundwater-substitution program.

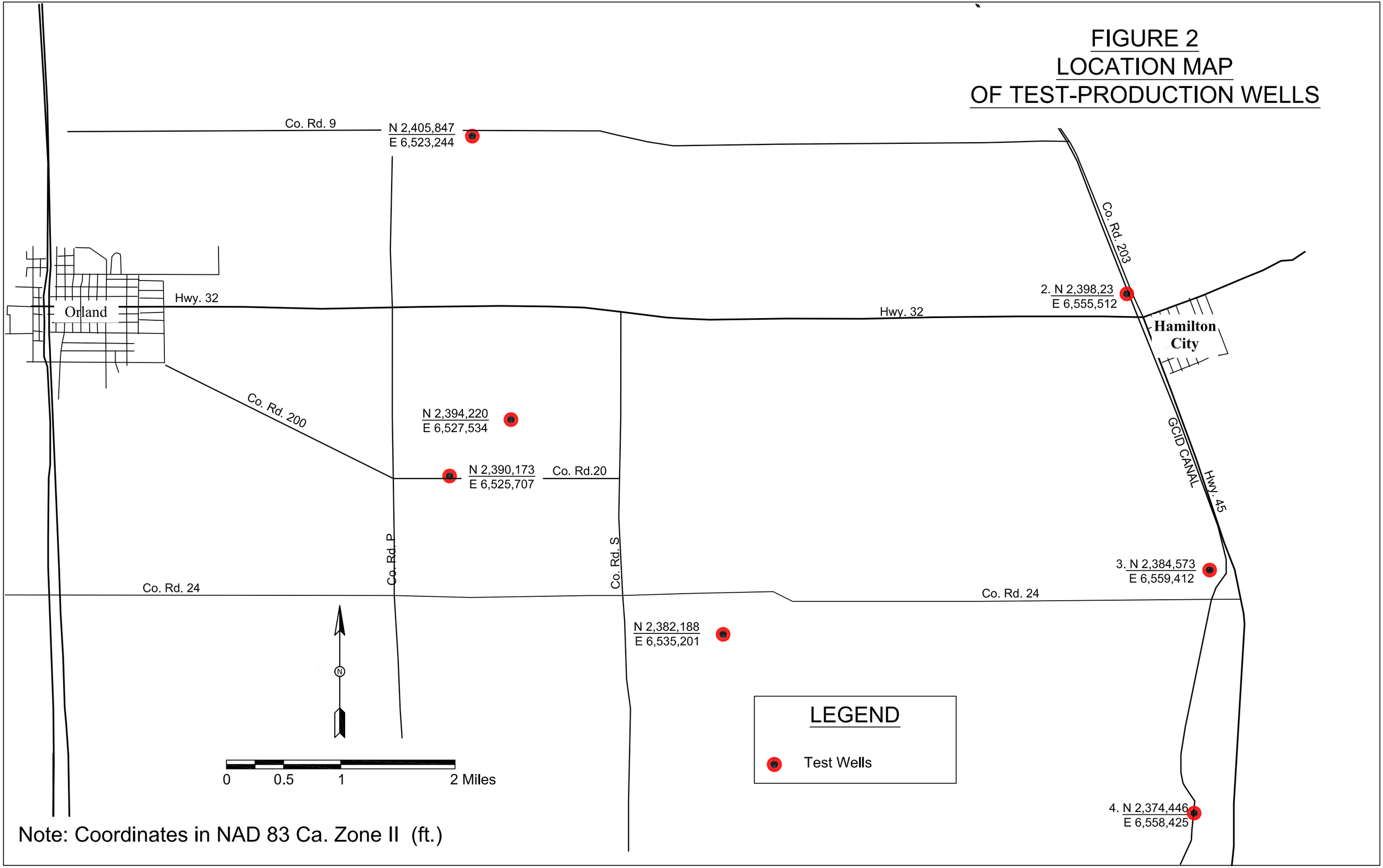
#### 2.2.1.2 Test-Production Well Construction

The SCF Partners plan to drill up to five test holes and construct up to seven test-production wells. It is anticipated that the test-production wells would produce groundwater from geologic units at depths ranging from approximately 700 to 1,500 feet below ground surface (bgs). The anticipated geologic units from which groundwater would be pumped are the Plio-Pleistocene Tehama and Tuscan Formations. Figure 2 shows the locations of the proposed test-production wells.

The test holes would be drilled for the purpose of obtaining direct information on the geologic formations in the immediate vicinity of the proposed test-production wells. Test hole data would be used to finalize the design of the test-production wells and help support efforts to establish the regional geologic framework for the area, including the depths and thicknesses of the Tehama and Tuscan Formations and the location of the contact between the two formations.

The test holes and test-production wells would be drilled using a large truck-mounted reverse circulation rotary drilling rig equipped with a mud pump, pipe rack, and drilling fluid holding tank/shaker system. Geologic and geophysical data collected during the drilling of the test holes would be used to supplement information developed by the DWR Northern District and other researchers to describe the hydrogeologic framework of the groundwater basin. Data to be collected would include but may not be limited to the following activities:

# FIGURE 2
# LOCATION MAP
# OF TEST-PRODUCTION WELLS




Note: Coordinates in NAD 83 Ca. Zone II (ft.)

- Review previous geologic exploration and well-logs in the vicinity.
- Collect samples of drill cuttings at 10-feet intervals.
- Conduct grain-size distribution analysis to support gravel-pack/screen size selection.
- Conduct geophysical surveys of the test hole, including digital logs of spontaneous potential (SP), 16-inch normal (short normal)/ 64-inch normal (long normal) resistivity, single point resistance, natural gamma ray, and temperature measurements, and X Y caliper with deviation.
- Conduct flow meter and down hole video camera surveys.
- Measure groundwater flow rates during pumping.
- Measure groundwater level fluctuation.

Test-production well construction at each site would occur 24 hours per day, seven days per week for approximately one week. Other drilling and testing activities would be conducted during normal work hours.

Additional support vehicles including a water tender, front-end loader, pipe truck, and pickup trucks would be parked on-site. The drilling rig and associated equipment would occupy an area of approximately 100 feet by 100 feet. Access for these vehicles would be directly off the adjacent paved road. No improvements for site access would be required. No off-site discharge of drill cuttings or fluids would occur. Drill cuttings and inert bentonite clay, produced during drilling operations, would be contained in an on-site settling pond and spread on site in an approved location upon well completion.

The surface completions for each test-production well would consist of an 8 by 10-feet concrete pad, pump-house enclosure and 20-inch discharge pipe. The 5 test holes would be either converted to multi-completion monitoring wells or abandoned in accordance with Glenn County requirements. The GCID and OUWUA wells would be located adjacent to irrigation canals. The discharge pipes of the GCID and OUWUA wells would be routed from the well sites to the canals, then down the canal bank slopes. Discharge would be at the edge of the canal water prism. The discharge piping for OAWD wells would be plumbed from each well site into an existing underground pipeline conveyance system. The typical test-production well construction diagram is shown in Figure 3. Drilling of test holes and construction of test-production wells is scheduled to begin early 2009 and be completed by Fall 2009. Phase 3 testing would begin after completion of all seven wells.

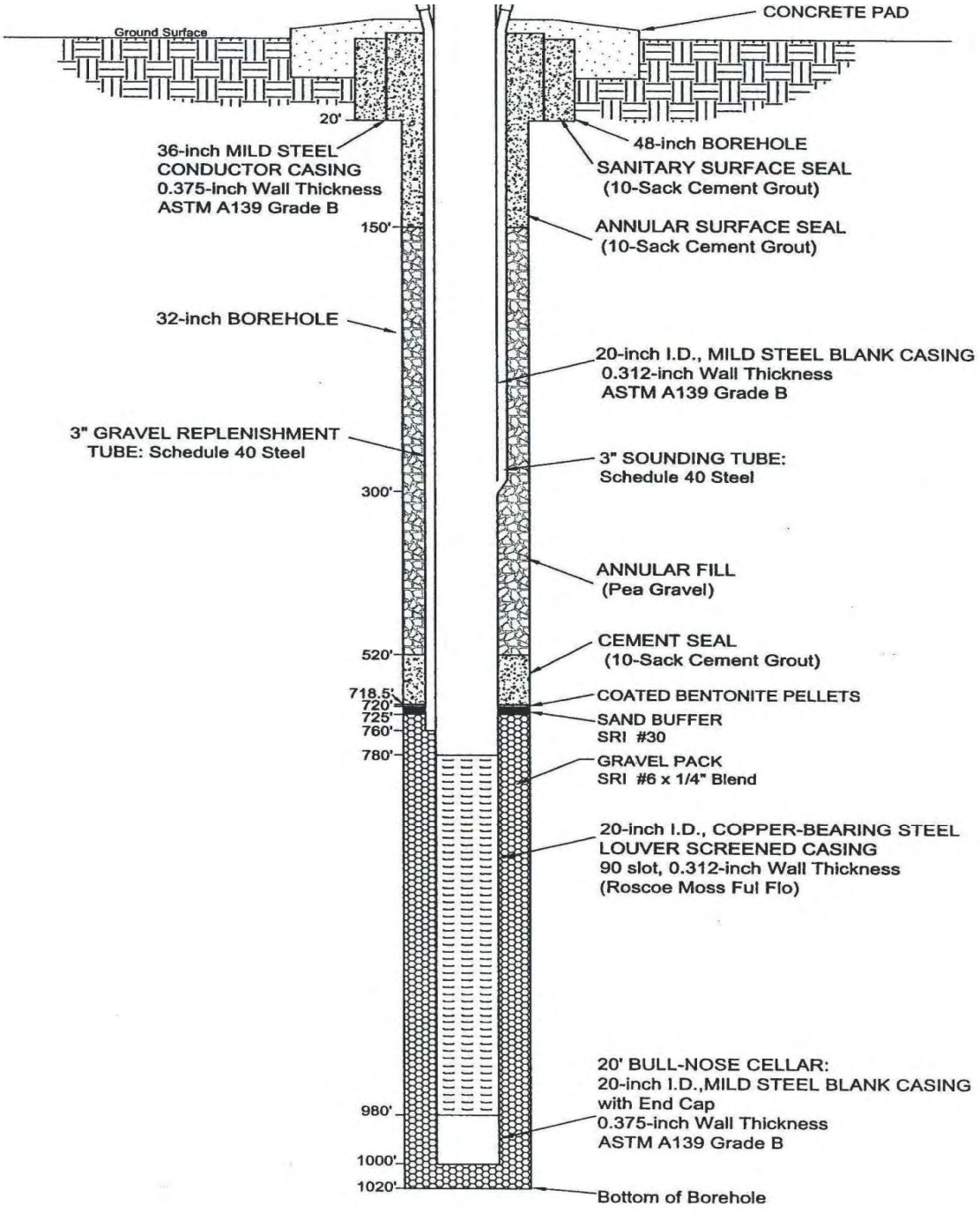



Figure 3.
Typical Test-Production Well Construction Diagram

### 2.2.1.3 Aquifer Testing Implementation

## *Aquifer Testing Phases*

The purpose of the test-production wells is to assess the aquifer system's responses to pumping at rates and schedules as identified below. Local effects in the vicinity of each test-production well can be assessed by aquifer testing of each well individually, and this type of testing is included in the APT. However, basin-scale aquifer responses that could potentially result in adverse impacts in future scenarios involving expanded conjunctive use are not measurable by short duration testing of a single test-production well. Therefore, operational testing of up to seven test-production wells is also included in the APT to provide a mechanism to collect data that can be used to assess the potential basin-scale effects of the expanded use of groundwater in the future.

Aquifer testing would be implemented in three phases to allow progressive refinement of the testing approach as more information becomes available.

These phases are briefly described below and discussed in detail in the following sections:

- Phase 1 – At the conclusion of test-production well construction at each location, specific capacity and hydraulic parameters would be estimated by performing 12 to 24 hour constant rate testing at each well. Information gathered during Phase 1 would be used to help ensure Phase 2 pumping rates and durations result in measurable water level changes at observation wells, but do not result in significant impacts.
- Phase 2 – Multi-day tests would be conducted at each well individually to refine hydraulic parameter estimates and assess potential groundwater level changes. Information gathered during Phase 2 would be used to help ensure Phase 3 pumping rates and durations result in measurable water level changes at observation wells, but do not result in significant impacts.
- Phase 3 – Potential basin-scale effects would be measured by performing operational testing for two consecutive irrigation seasons, following construction of all 7 wells. Phase 3 testing would involve simultaneous operation of multiple wells, as the intent is to observe the effects of their combined operation on the aquifer system.

Frequent and detailed monitoring would be performed during each phase of the testing to meet data collection requirements. The data and information compiled during implementation of this aquifer testing plan would be used as input prior to longer term use of the wells and would require future environmental review.

**Phase 1 – Step and Constant Rate Testing During Well Construction**

Standard industry practice calls for step and constant rate pump testing near the conclusion of the well construction process. These tests are used to assess the capacity of the well and size pumping equipment. The pumping capacity of each well would depend on the hydraulic parameters of the aquifer system, well construction, and the amount of drawdown that is

considered acceptable in each well, based on operational requirements and well efficiency. The hydraulic parameters of the aquifer and well characteristics are fixed after a well is constructed, and the capacity depends on the amount of drawdown that is considered acceptable. The acceptable level of drawdown in the well depends on a variety of site-specific conditions that cannot be fully assessed prior to well construction and testing. Therefore, the hydraulic properties of the aquifer around each well, and the capacity of each well would be assessed using temporary well development equipment near the conclusion of the well construction effort.

Step testing would be conducted to estimate the specific capacity of each well. The step test is conducted by pumping the well in a series of steps in which the pumping rate is incrementally increased at specified time intervals. The step test is a short duration test that takes no more than a day to complete at each well. The step test results would be used to prepare data graphs of: a) drawdown versus pumping rate, and b) drawdown and well efficiency versus pumping rate. Based on this information, the SCF Partners would select the pump and electric motor to be installed in each well.

Estimates of the hydraulic parameters – transmissivity and storage coefficient – in the near vicinity of each well are necessary for calculating estimates of the extent of drawdown in the vicinity of the well as a function of pumping rate and duration. Initial estimates of the transmissivity at each well location would be made using the Theis recovery method applied to a 12 to 24 hour constant discharge rate test of each well. The Theis recovery method is a standard method used to calculate transmissivity from the water level recovery data obtained from a pumped well as it recovers after being pumped at a known, constant rate for a specified period of time. The method is based on the Theis analytical solution to the groundwater diffusion equation for time-dependent flow to a well penetrating a confined aquifer. The storage coefficient cannot be calculated using this approach, and would be estimated from hydrogeological data. If a monitoring well is located near the test-production well, drawdown measured in the monitoring well would be used to calculate the transmissivity and storage coefficient using the Theis equation. It is anticipated that the test-production wells would be tested at flows ranging from about 1,500 to 4,000 gallons per minute (gpm). During the Phase 1 testing, the amount of groundwater pumping per well would be approximately 10 acre-feet, or a total of about 70 acre-feet for all seven wells. The amount is based on an estimated test duration of 1 day, and an average test pumping of 2,300 gpm (1,000 gpm=4.42 acre feet/day).

**Phase 2 – Multi-Day Well Testing**

The objectives of the multi-day constant rate tests are to: (1) estimate the hydraulic parameters of the aquifer system over a wider radius than assessed in 12 to 24 hour constant rate testing performed in Phase 1; (2) assess potential effects on groundwater levels at specific observation well locations in the vicinity of each test-production well; and (3) provide a basis for planning target production rates and operational schedules for the Phase 3 operational testing of the wells. The multi-day well testing is scheduled to occur when groundwater pumping by others is limited (likely between irrigation seasons). The purpose of this scheduling is to allow collection of test data with minimal interference from other pumping wells, and minimize the potential to impact other pumping wells. During the Phase 2 testing, the maximum amount of groundwater pumped would be approximately 540 acre-feet per well, with a maximum total of 3,780 acre-feet

combined for all seven wells. The amount is based on test duration of 30 days and pumping rate of 4,000 gpm.

The initial estimates of the zone of influence of each test-production well developed during Phase 1 would be used to design multi-day constant rate aquifer tests appropriate for the site-specific conditions near each test-production well. Test design would include:

- Evaluation of the Phase 1 results and framework geology in the test area
- Identification of potentially relevant aquifer depth zones to be monitored with existing/proposed multi-completion monitoring wells.
- Identification and evaluation of other wells in the vicinity
- Layout of the monitoring network,
- Selection of the pumping rate, and the duration of testing.

The monitoring network would include DWR, Glenn County, and SCF Partners' monitoring wells, and other nearby monitoring wells and production wells as appropriate. Figure 4 shows the locations of wells included in ongoing groundwater monitoring in the northern Sacramento Valley. Historical groundwater levels obtained from these wells are available at the DWR Water Data Library at http://wdl.water.ca.gov. This groundwater level data would be used to develop historical baseline groundwater level conditions for the study area and surrounding region.

An initial estimate of the extent of drawdown around each well is needed to identify existing production wells that may potentially be affected by multi-day pumping of the test-production wells, and to identify monitoring wells that may be used to measure drawdown induced by pumping of each test-production well. The initial estimate of the extent of drawdown would be calculated using an appropriate analytical solution to the groundwater flow equation. This would enable calculation of estimated drawdown over extended areas, pumping periods and varying aquifer conditions. Inputs would be the target production rate, initial estimates of aquifer hydraulic parameters, aquifer thickness and other geological data and well information available from DWR Northern District.

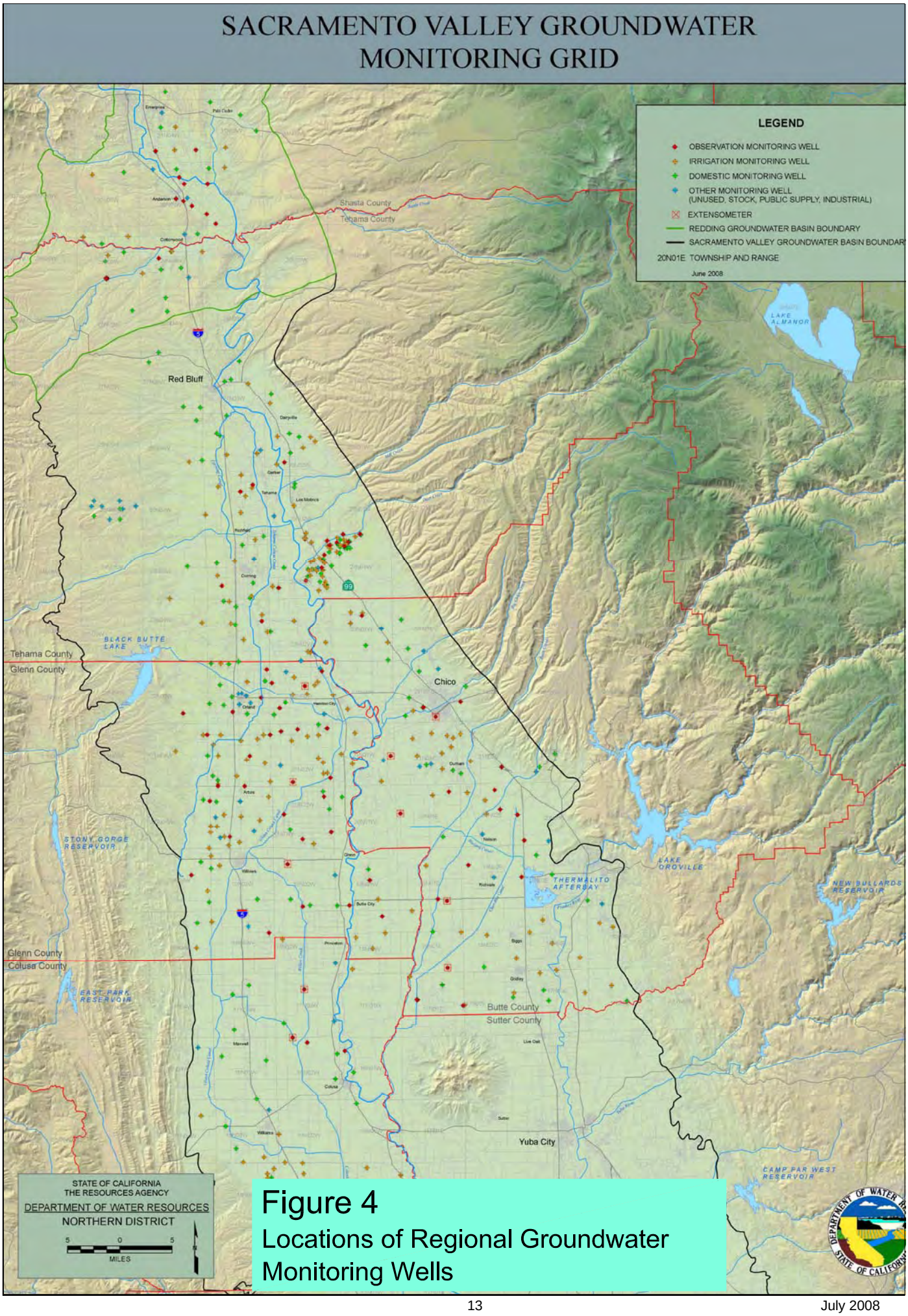



Figure 4
Locations of Regional Groundwater Monitoring Wells

**Phase 3 – Operational Testing**

The test-production wells would be operated during two consecutive irrigation seasons, subsequent to the Phase 2 testing, as follows:

1. On or about May 1, the wells would be turned on. The water developed from the wells would be used on lands located within the SCF Partners' respective areas.
2. The Partners would consult with DWR Northern District and Glenn County WAC and TAC as the ATP proceeds.
3. Monitoring data would include flow rates for each of the test-production wells; depth to groundwater measurements in the test-production wells and observation wells in the vicinity; depth to groundwater measurements in critical areas of the groundwater basin, including recharge areas and areas in which groundwater resources are considered limited; extensometer measurements; and land subsidence benchmark repeat surveys, if available.
4. The wells would be operated at an assumed capacity of 4,000 gpm (1000 gpm=4.42 acre feet/day) for approximately six months for a maximum total pumping volume of about 3,240 AF per well, or a total of 22,680 AF for all seven wells. As stated previously if such monitoring indicates a significant decline in groundwater levels in the relevant vicinity of the test pumps, and that any such decline is not directly attributable to a cause other than the pilot testing project, then the test pumping would be modified or terminated as necessary to avoid any significant adverse impacts.

***Reporting***

The aquifer testing program described in this document would contribute to building the body of knowledge regarding northern Sacramento Valley hydrogeology, hydrostratigraphy, aquifer transmissivity, storage, hydraulic conductivity between layers, sources of recharge, aquifer system performance and the potential to develop and use groundwater in a responsible, sustainable manner. Data gathered during the three test phases described above would be made available to all interested parties through DWR Northern District, subject to DWR's protocols for data quality control and publication. Progress would be reported at regularly scheduled Glenn County WAC and TAC meetings. An interim report summarizing test results through the end of the first irrigation season in which the test-production wells are operated would be issued during the first quarter of the following calendar year. A final report that documents the tests performed, the data collected, and the results of data analysis would be issued during the first quarter of the calendar year following completion of Phase 3 testing.

#### 2.2.1.4 Right of Use Application and Warren Act Contract(s)

If the United States is not going to be holding title to the new features (i.e. production wells) in the proposed action, then 43 CFR 429 is applicable and a Right of Use (ROU) contract must be executed, regardless of the other actions. The analysis in this environmental assessment covers Reclamation's execution of a ROU for well installation on the federal right of way. Specifically, the wells proposed for construction in the OUWUA would be sited on federal property. Therefore, a ROU is required for use of the federal right of way. Under the ROU, the Stony

Creek Fan Partners would be required to reimburse Reclamation for any administrative costs associated with the proposed action and use fees shall be waived.

Under Section 1 of the Warren Act, act of February 21, 1911, 36 Stat. 925, the Secretary of the Interior, is authorized, upon such terms as he may determine to be just and equitable, to contract for the impounding, storage, and carriage of water to an extent not exceeding such excess capacity with irrigation systems operating under the Carey Act, and individuals, corporations, associations, and irrigation districts organized for or engaged in furnishing or in distributing water for irrigation. Reclamation's only authority under which to allow the conveyance and/or storage of non-Project agricultural water in Project facilities is via the Warren Act. In this case, Reclamation has determined that a Warren Act contract is not necessary for the diversion of groundwater, since the pumped groundwater would only be used within the OUWUA. If the water were diverted outside the OUWUA service area boundaries, a Warren Act contract would be executed and further environmental analysis would be completed for the action

### *2.2.2 Implementation Schedule*

The schedule for implementing the proposed SCF APT is shown on Figure 5. Under the SCF APT, the SCF Partners are attempting to have the drilling, construction, and Phase 1 testing of the test-production wells completed Spring 2009. An exception would be test well #5, which would be installed after April 1, 2009 in order to avoid potential impacts to the giant garter snake. Based on the time required to order and install pumps, motors, and electric power after Phase 1, Phase 2 testing is scheduled in Fall 2009 after irrigation demands have decreased. This schedule would allow adequate time for Phase 2 testing to be completed when groundwater pumping by others is minimal. The aquifer responses to test-production well pumping can be more readily distinguished and quantified when groundwater pumping is minimal. Based on construction completion and Phase 1 and 2, Phase 3 aquifer testing may not occur until the 2010 and 2011 irrigation seasons beginning in approximately April or May and continuing through October.

### *2.2.3 Monitoring and Mitigation*

The Glenn County GMP, which is implemented under Glenn County Ordinance 1115, provides the management and institutional framework for assessing and managing these potential impacts, and is incorporated in this plan by reference. Ordinance 1115 includes six key groundwater management elements (http://www.glenncountywater.org/management_plan.htm):

1. Management areas and subareas
2. Basin Management Objectives (BMOs)
3. Public Input
4. Monitoring
5. Adaptive Management
6. Enforcement/Conflict Resolution.

Glenn County contains 17 groundwater management subareas. These subareas are delineated based on water agency boundaries, and, for areas of the county that do not lie within water agency boundaries, similarities in hydrology and agricultural practices. Groundwater level

BMOs have been developed for each of the 17 subareas. BMOs addressing water quality and inelastic land subsidence are being developed.

Public input is provided through the 21-member WAC, which includes a representative from each of the 17 subareas, and one representative each from the Glenn County Farm Bureau, the Resource Conservation District, the City of Orland, and the City of Willows. The WAC representatives establish the BMOs for their subareas and provide communication between the local groundwater users, the WAC and the Board of Supervisors. A 10-person TAC, comprised of technical representatives from federal, state, county, and local agencies, the general public provides technical support to the WAC.

As discussed above, groundwater management in Glenn County is supported by groundwater level, groundwater quality and inelastic land subsidence monitoring networks developed by the DWR, Northern District and the local water agencies. The information from these networks is used in an adaptive management approach that focuses on resolution of issues at the local level. Issues that can not be resolved at the local level can be put before the County Board of Supervisors for resolution.

The SCF APT would be conducted within this Glenn County groundwater management framework. The SCF APT also includes phased planning for additional monitoring beyond what is required under the Glenn County GWMP. Potential effects associated with the SCF APT are:

1. Declines in groundwater levels that negatively affect neighboring wells.
2. Changes in groundwater or surface water quality brought on by the proposed project
3. Increases in the rate of inelastic land subsidence.

Phasing of the SCF APT would allow adjustment of the SCF APT to mitigate any adverse impacts that could potentially occur. Potential impacts would be assessed throughout the SCF APT by comparing baseline data and monitoring data collected during the test. Baseline groundwater level, groundwater quality and land subsidence monitoring have been underway since at least 2003.

**Baseline Monitoring.** DWR monitors groundwater levels in over 100 single and multi-completion observation wells throughout the northern Sacramento Valley on a quarterly basis, and over 300 irrigation and domestic wells semi-annually (Figure 4). Continuous groundwater level data loggers are installed in the majority of observation wells monitoring the various aquifer zones that are pumped in the northern Sacramento Valley (Figures 7 and 13).

In addition to helping to establish baseline conditions, these existing observation wells would be used to monitor pumping effects induced by the test-production wells when and where possible. Several of the test-production well locations are within a three- to four-mile radius of existing DWR observation wells.

Because the majority of observation wells have been installed in the last ten years, groundwater levels measured in domestic and irrigation wells over longer time periods would also be used to evaluate seasonal and multiyear groundwater level fluctuations. These data are maintained by

DWR and are available to the public via internet access through the DWR Water Data Library (http://wdl.water.ca.gov/gw/).

Baseline groundwater quality information was collected during previous aquifer performance testing of the existing GCID test-production well. Additional baseline water quality is available at http://wdl.water.ca.gov/gw/. As part of its groundwater management activities, Glenn County has been collecting baseline temperature, pH, and electrical conductivity measurements in wells.

DWR has eight extensometers in the Sacramento Valley that measure land subsidence (Figures 7 and 13). Additionally, Butte, Colusa, Glenn and Tehama counties have established a Global Positioning System land subsidence network. The subsidence data would be reviewed to identify any changes that occur during the test pumping, and to determine if there is any causal connection.

**Groundwater Monitoring and Mitigation.** Phases 1 and 2 would be conducted on a well-by-well basis over relatively short time frames when pumping by other entities is not at a maximum. Each well would be pumped for a limited period of time, and the groundwater levels would recover between each Phase 1 and 2 testing periods. Phase 3 would involve simultaneous pumping of all of the constructed test-production wells.

**Phase 1 Monitoring and Mitigation.** Phase 1 of the SCF APT would involve only very short duration testing of each of the test-production wells as needed to assess well capacity and size the pumping equipment. Because of the limited nature of the Phase 1 testing, no adverse effects are likely. Phase 1 monitoring would consist of groundwater level monitoring using digital data loggers in each of the test-production wells and continuation of ongoing regional groundwater level groundwater quality and land subsidence monitoring activities carried out by DWR Northern District and the local agencies (Figures 4, 7 and 13).

Groundwater quality samples would be collected from each of the test-production wells at the end of the Phase 1 testing. The samples would be analyzed for general mineral and physical parameters, soluble metals and stable isotopes of oxygen and hydrogen. The results would be compared to the baseline sample results.

Rates of elastic and inelastic land subsidence measured using the DWR extensometer network during the Phase 1 testing would be compared to baseline rates measured in the same network during periods in which historical hydrologic conditions were similar to those occurring during the Phase 1 testing.

The results of the Phase 1 testing would be made available to the public through the Glenn County WAC. Any concerns expressed by the public or members of the WAC would be considered during planning of the Phase 2 testing. Any conflicts or disputes arising from the testing would be resolved through the Glenn County GWMP dispute resolution process.

**Phase 2 Monitoring and Mitigation.** Phase 2 of the SCF APT would involve a series of individual test-production well tests in which each test-production well would be pumped at a

constant rate for approximately 28-days. Phase 2 is scheduled before the irrigation season to minimize potential effects from or on nearby wells.

The estimated radius of influence of each test-production well would depend on the measured performance characteristics of each constructed test-production well, as determined during Phase 1 and 2 testing. An estimated radius of influence of approximately five miles would be used for test-production wells with measured hydraulic parameters (transmissivity and storativity) similar to the existing GCID test-production well (22N02W02J001M). A different radius of influence may be selected for test-production wells with measured transmissivity different than the existing GCID test-production well. The Phase 2 radius of influence of each test-production well would be assessed using numerical modeling and the hydraulic parameters measured at each constructed test-production well during Phase 1. Monitoring for the Phase 2 testing would be based in part on the DWR Northern District network of monitoring wells shown on Figure 13 and BMO wells used to implement the Glenn County GWMP. Phase 2 testing would also include groundwater level measurements in wells indentified within up to an approximate five mile radius of each of the completed test-production wells. Some of these wells, which have records in DWR Water Data Library, are shown on Figure 4.

Individual wells within the estimated radius of influence of each constructed test-production well would be identified through a search of the DWR Drillers Completion Report database and public notification implemented through the Glenn County WAC. Well owners within the estimated radius of influence of each of the constructed test-production wells would be notified in advance of the Phase 2 testing and would be given the opportunity to have groundwater levels measure in their wells prior to, during and after the Phase 2 testing. Any concerns raised by owners' of any wells monitored during the Phase 2 testing would be evaluated by the Glenn County WAC. The continuation of Phase 2 test of the specific test-production well in question would be subject to the Glenn County GWMP dispute resolution process. This could include modifying or terminating the Phase 2 testing of the specific test-production well, if that test-production well is determined by the WAC to be the cause of the impact.

Depending on physical access to the wells, groundwater level measurements would be made manually or with digital data loggers.

Groundwater quality samples would be collected from each of the test-production wells at the end of the Phase 2 testing. The samples would be analyzed for general mineral and physical parameters, soluble metals and stable isotopes of oxygen and hydrogen. The results would be compared to the baseline and Phase 1 sample results.

Rates of elastic and inelastic land subsidence measured using the DWR extensometer network during the Phase 2 testing would be compared to baseline rates measured in the same network during periods in which historical hydrologic conditions were similar to those occurring during the Phase 2 testing.

The results of the Phase 2 testing would be made available to the public through the Glenn County WAC. Any concerns expressed by the public or members of the WAC would be

considered during planning of the Phase 3 testing. Any conflicts or disputes arising from the testing would be resolved through the Glenn County GWMP dispute resolution process.

**Phase 3 Monitoring and Mitigation.** The monitoring for the Phase 3 testing would be based on ongoing monitoring of the regional monitoring wells shown on Figure 4, the DWR Northern District network of monitoring wells shown on Figure 13 and BMO wells used to implement the Glenn County GWMP. Phase 3 testing would also include groundwater level measurements in wells owned by others indentified during or after the Phase 2 testing. These latter wells could include wells monitored during Phase 2, additional wells identified during or after Phase 2, or wells for which the owner requested Phase 3 but not Phase 2 monitoring.

Prior to Phase 3 testing, the Phase 2 monitoring results would be evaluated to refine estimates of the hydraulic properties of the aquifer (transmissivity and storativity) and the lateral and vertical extent of drawdown around each of the test-production wells. The resulting information would be used in a numerical model to estimate the timing and extent of drawdown associated with the Phase 3 testing. This information would be used to estimate the lateral and vertical extent of cumulative drawdown effects associated with Phase 3 pumping.

Individual wells within the estimated area of influence of constructed test-production wells would be identified through re-evaluation of the DWR Drillers Completion Report database and public notification implemented through the Glenn County WAC. All well owners within the estimated area of influence of the Phase 3 tests would be notified in advance of the Phase 3 testing and would be given the opportunity to have groundwater levels measured in their wells prior to, during and after the Phase 3 testing.

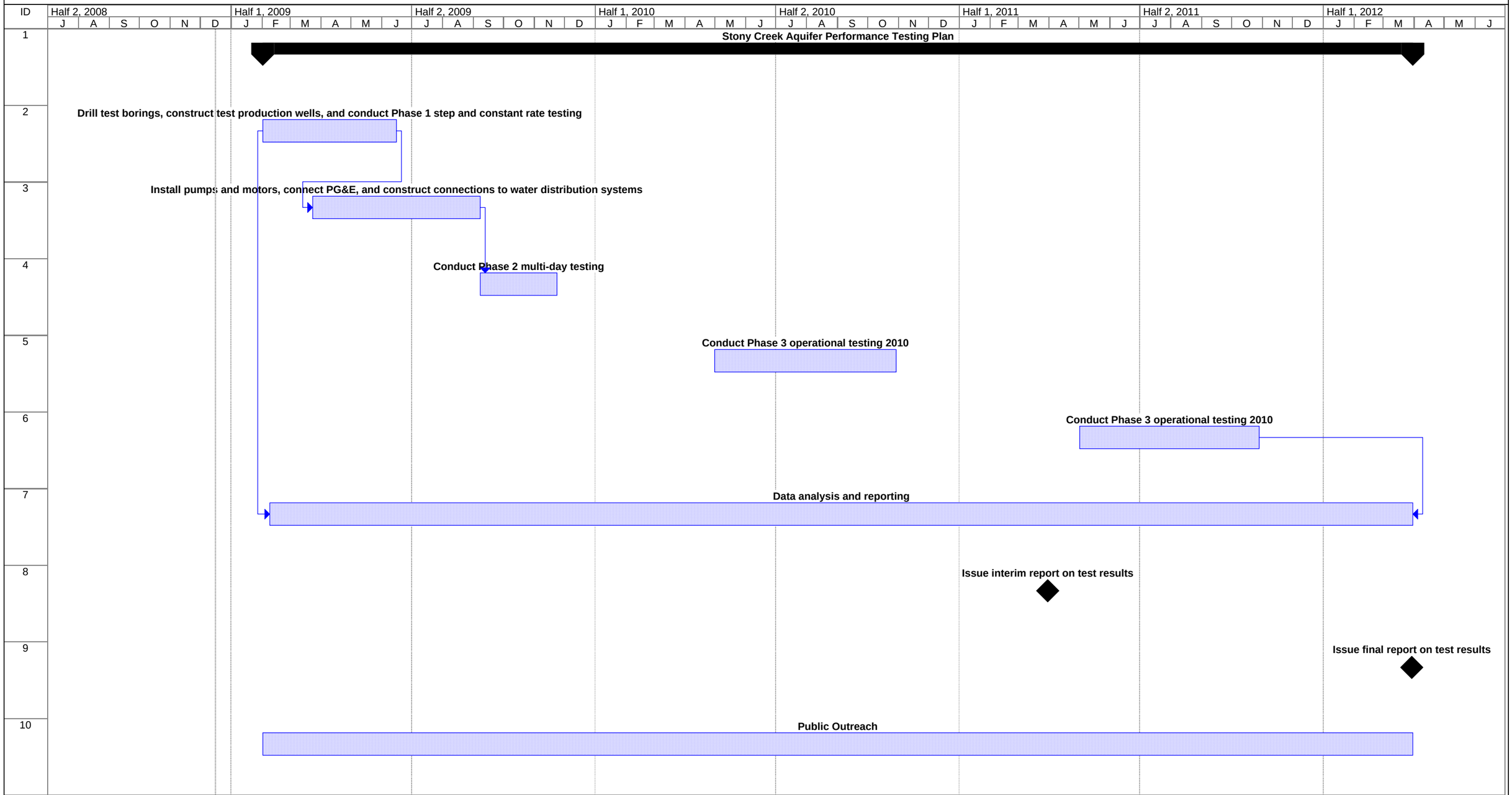
Depending on physical access to the wells, groundwater level measurements would be made manually or with digital data loggers.

Groundwater water quality samples would be collected from each of the test-production wells near the end of each irrigation season of the Phase 3 testing. The samples would be analyzed for general mineral and physical parameters, soluble metals and stable isotopes of oxygen and hydrogen. The results would be compared to the baseline, Phase 1 and Phase 2 sample results.

Rates of elastic and inelastic land subsidence measured using the DWR extensometer network during the Phase 3 testing would be compared to baseline rates measured in the same network during periods in which historical hydrologic conditions were similar to those occurring during the Phase 3 testing.

Any concerns raised by owners' of any wells monitored during the Phase 3 testing would be evaluated by the Glenn County WAC and would be subject to the Glenn County GWMP dispute resolution process. The dispute resolution process could result in modification or termination of Phase 3 testing for a specific test-production well, if that test-production well is determined to be the cause of the impact by the WAC. The results of the Phase 3 testing would be made available to the public through the Glenn County WAC.

# Figure 5. Stony Creek Fan Aquifer Performance Test Plan Schedule




Note: This schedule is contingent on receiving required environmental approvals by the end of January 2009, and having the test-production wells equipped and supplied with PG&E electrical power as indicated above. Delays in either attaining environmental approvals or completing the well equipping and power supplies could result in delays in the overall schedule. Evaluation of potential environmental affects associated with the Stony Creek Fan Aquifer Performance Test will be based on a two-year duration beginning when the wells are equipped and supplied with PG&E electrical power. Phase 3 testing is limited to two irrigation seasons.